AL.2.2002-171

...udent and teacher: Use this cover sheet for mailing or faxing.

University of Alberta Library
0 1620 3409730 1

ASSIGNMENT BOOKLET 5A

MAT2037 Pure Mathematics 20
Module 5: Section 1 Assignment and Section 2 Assignment

FOR STUDENT USE ONLY	
Date Assignment Submitted: _____	(If label is missing or incorrect) Student File Number: _____
Time Spent on Assignment: _____	Module Number: _____

FOR OFFICE USE ONLY

Assigned Teacher: _____

Assignment Grading: _____

Graded by: _____

Date Assignment Received:

Student's Questions and Comments

Apply Module Label Here

Name

Address

Postal Code

Please verify that preprinted label is for correct course and module.

Teacher's Comments

_____
Teacher

INSTRUCTIONS FOR SUBMITTING THIS DISTANCE LEARNING ASSIGNMENT BOOKLET

When you are registered for distance learning courses, you are expected to regularly submit completed assignments for correction. Try to submit each section of assignments as soon as you complete it. Do not submit more than one Assignment Booklet in one subject at the same time. Before submitting your section assignments or your Assignment Booklet, please check the following:

- Are all the assignments completed? If not, explain why.
- Has your work been reread to ensure accuracy in spelling and details?
- Is the booklet cover filled out and the correct module label attached?

MAILING

1. Postage Regulations

Do **not** enclose letters with your assignments or Assignment Booklets.

Send all letters in a separate envelope.

2. Postage Rates

Put your assignments or Assignment Booklet in an envelope and take it to the post office and have it weighed. Attach sufficient postage and seal the envelope. Assignment Booklets will travel faster if sufficient postage is used and if they are in large envelopes that do not exceed two centimetres in thickness.

FAXING

1. Assignment Booklets may be faxed to the school with which you are registered. Contact your teacher for the appropriate fax number.

2. All faxing costs are the responsibility of the sender.

E-MAILING

It may be possible to e-mail your completed assignments to the school with which you are registered. Contact your teacher for the appropriate e-mail address.

Pure MATHEMATICS 20

Module 5
Mathematical Reasoning and Geometry
Assignment Booklet 5A

Learning Technologies Branch

Alberta LEARNING

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Section 1 Assignment	40	
Section 2 Assignment	40	
	80	

Teacher's Comments

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Parents	
General Public	
Other	

Pure Mathematics 20
Module 5: Mathematical Reasoning and Geometry
Assignment Booklet 5A
Learning Technologies Branch
ISBN 0-7741-1903-9

ALL RIGHTS RESERVED

Copyright © 1999, 2001, the Crown in Right of Alberta, as represented by the Minister of Learning, Alberta Learning, 11160 Jasper Avenue, Edmonton, Alberta T5K 0L2. All rights reserved. Additional copies may be obtained from the Learning Resources Centre.

No part of this courseware may be reproduced in any form, including photocopying (unless otherwise indicated), without the written permission of Alberta Learning.

Every effort has been made both to provide proper acknowledgement of the original source and to comply with copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Learning so that appropriate corrective action can be taken.

IT IS STRICTLY PROHIBITED TO COPY ANY PART OF THESE MATERIALS UNDER THE TERMS OF A LICENCE FROM A COLLECTIVE OR A LICENSING BODY.

UNIVERSITY LIBRARY
UNIVERSITY OF ALBERTA

ASSIGNMENT BOOKLET 5A
PURE MATHEMATICS 20: MODULE 5
SECTION 1 ASSIGNMENT AND SECTION 2 ASSIGNMENT

Your mark on this module will be determined by how well you do your assignments in the Assignment Booklets.

This Assignment Booklet is worth 80 marks out of the total 160 marks for Module 5.

Work slowly and carefully. If you are having difficulties, go back and review the appropriate topic.

Be sure to proofread each assignment carefully.

Section 1 Assignment: Mathematical Reasoning

(40)

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

1. Christian Goldbach, an eighteenth-century mathematician, conjectured that every even integer larger than 4 can be represented as the sum of two odd prime numbers.

(2) **a.** Provide two numerical examples that support Goldbach's conjecture.

(3) **b.** Goldbach's conjecture has never been proven. Do you think his conjecture was based on inductive reasoning or deductive reasoning? Explain.

(3) **2.** Make a conjecture about the next 3 terms in the sequence 1, 5, 2, 8, 3, 11, ... Explain your reasoning.

(3)

3. Evaluate the following sums:

1

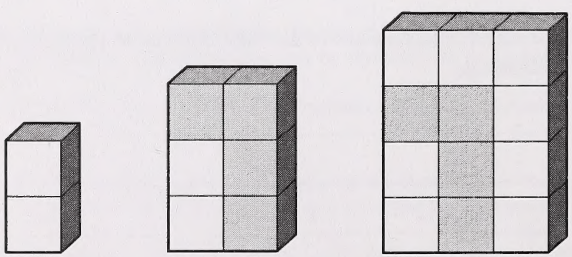
$1+8$

$1+8+27$

$1+8+27+64$

Add two more lines to the list, and make a conjecture about the sums you obtained.

4. Jacques was keeping his younger sister, Beth, amused by forming towers with blocks. They began with a short tower consisting of two blocks. They then added one block to the top of the tower and placed a second tower the same height next to the first tower. Jacques and Beth continued this pattern for the third tower.



Jacques noticed that they added an even number of blocks in each step. They started with 2, then added 4, and then added 6. He also noticed that the total number of blocks was related to the number of adjacent towers.

Number of Towers	Total Number of Blocks
1	$2=1\times2$
2	$2+4=6$ $=2\times3$
3	$2+4+6=12$ $=3\times4$

Jacques concluded that the sum of the first n even numbers is $n(n+1)$; that is,

$2+4+6+\cdots+2n=n(n+1)$.

(2) **a.** Did Jacques use inductive reasoning or deductive reasoning to reach his conclusion? Explain.

(4) **b.** Jacques's mother observed that $2+4+6+\cdots+2n$ is an example of an arithmetic series and that the sum of the terms of an arithmetic series is determined as follows:

$$t_1+t_2+t_3+\cdots+t_n=\frac{n(t_1+t_n)}{2}$$

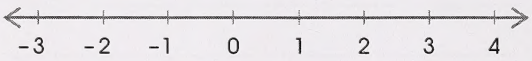
Prove Jacques's conjecture using this formula. Is the proof an example of inductive reasoning or deductive reasoning? Explain.

(3) **5.** Jean noticed that the diagonals of a square cross at right angles and that a square is also a parallelogram. Jean made the following conjecture:

"If the diagonals of a parallelogram cross at right angles, then it is a square."

Sketch a counterexample that disproves Jean's conjecture. What is the name of the quadrilateral you drew?

(2) **6.** Show the set of numbers that satisfies the compound sentence $n < 3$ and $n \geq -2$ on the number line given.



7. The following is an example of a true conditional statement:

"If it is a quadrilateral, then it is a polygon."

(3) **a.** What is the converse? Is it true? Explain.

(3) **b.** What is the contrapositive? Is it true? Explain.

8. In a local high school, there are 100 students in grade 11. Each student takes at least one of the three sciences: biology, physics, and chemistry. Of the 50 students taking biology, 14 students also take physics and 32 students also take chemistry. Of the 30 students taking physics, 16 also take chemistry. There are 10 students who take all three sciences.

(3) **a.** Draw a Venn diagram to display the information.

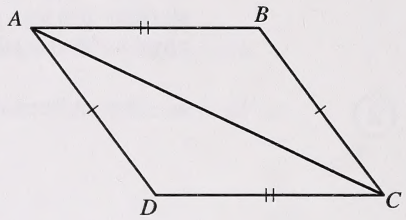
(2) **b.** How many students take only chemistry?

_____

(2) **c.** How many students take biology or chemistry, but not physics?

_____

(5) **9.** Given $AB = CD$ and $AD = BC$, prove that $\angle DAC = \angle BCA$.



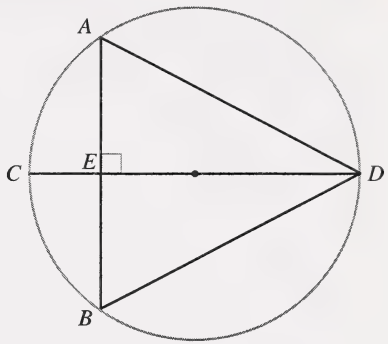
(40)

Section 2 Assignment: Circle Geometry

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

(6)

1. Given a circle with chord AB and diameter CD, prove that ΔABD is isosceles if $AB \perp CD$.

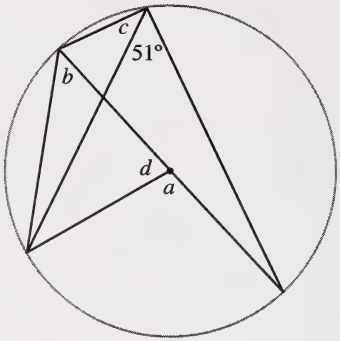


(4)

2. A circular culvert has a radius of 30 cm. The depth of water in the culvert is 45 cm. What is the width of the water surface in the culvert? Round your answer to the nearest centimetre.

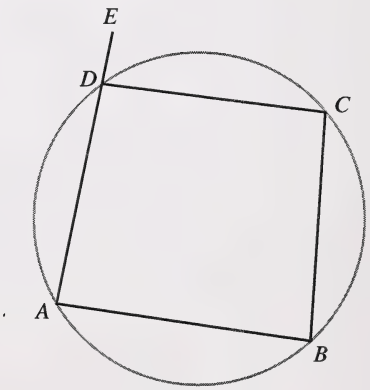
(8)

3. Find the measures of $\angle a, \angle b, \angle c$, and $\angle d$. Explain your reasoning in each case.

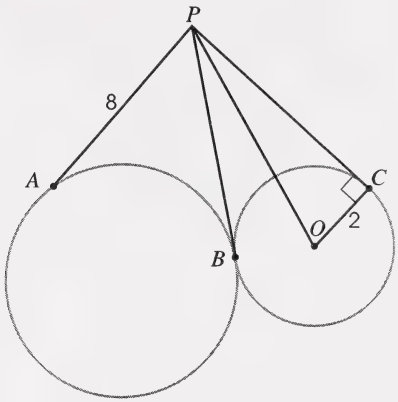


(5)

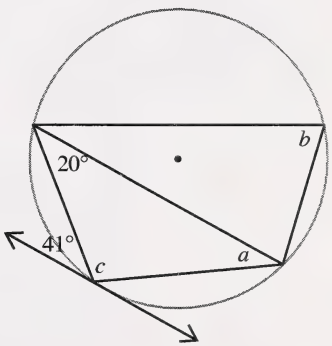
4. *ABCD* is a cyclic quadrilateral. If $\angle EDC = 5x - 6$, $\angle C = 7x$, and $\angle B = 3x + 28$, find the measure of $\angle ADC$.



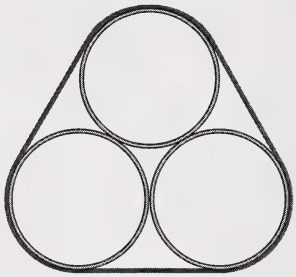
(4) **5.** In the diagram, tangents have been drawn from P to the circles. If O is the centre of the smaller circle, find the exact value of PO. Explain your reasoning.



(4) **6.** A tangent line is shown in the diagram. Find the measures of $\angle a$ and $\angle b$. Give reasons for your answers.



(5) **7.** Three circular pipes with 30-cm diameters are strapped together (as shown). Find the length of the strap to the nearest centimetre.



8. Each exterior angle of a regular polygon is 15°.

(2) **a.** Determine the number of sides of the polygon.

(2) **b.** What is the sum of the interior angles?

Pure Mathematics 20
Assignment Booklet 5A
Module 5

LRC

1999, 2001

NO ILL
c.2
v.5

Student and teacher: Use this cover sheet for mailing or faxing.

ASSIGNMENT BOOKLET 5B

MAT2037 Pure Mathematics 20
Module 5: Section 3 Assignment and Final Module Assignment

FOR STUDENT USE ONLY	
Date Assignment Submitted: _____	(If label is missing or incorrect)
	Student File Number: _____
Time Spent on Assignment: _____	Module Number: _____

FOR OFFICE USE ONLY
Assigned Teacher: _____
Assignment Grading: _____
Graded by: _____
Date Assignment Received:

Student's Questions and Comments

Apply Module Label Here

Name
Address
Postal Code

Please verify that preprinted label is for correct course and module.

Teacher's Comments

_____
Teacher

INSTRUCTIONS FOR SUBMITTING THIS DISTANCE LEARNING ASSIGNMENT BOOKLET

When you are registered for distance learning courses, you are expected to regularly submit completed assignments for correction. Try to submit each section of assignments as soon as you complete it. Do not submit more than one Assignment Booklet in one subject at the same time. Before submitting your section assignments or your Assignment Booklet, please check the following:

- Are all the assignments completed? If not, explain why.
- Has your work been reread to ensure accuracy in spelling and details?
- Is the booklet cover filled out and the correct module label attached?

MAILING

1. Postage Regulations

Do **not** enclose letters with your assignments or Assignment Booklets.

Send all letters in a separate envelope.

2. Postage Rates

Put your assignments or Assignment Booklet in an envelope and take it to the post office and have it weighed. Attach sufficient postage and seal the envelope. Assignment Booklets will travel faster if sufficient postage is used and if they are in large envelopes that do not exceed two centimetres in thickness.

FAXING

1. Assignment Booklets may be faxed to the school with which you are registered. Contact your teacher for the appropriate fax number.

2. All faxing costs are the responsibility of the sender.

E-MAILING

It may be possible to e-mail your completed assignments to the school with which you are registered. Contact your teacher for the appropriate e-mail address.

Pure MATHEMATICS 20

Module 5

Mathematical Reasoning and Geometry

Assignment Booklet 5B

Learning Technologies Branch

Alberta LEARNING

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Section 3 Assignment	60	
Final Module Assignment	20	
	80	

Teacher's Comments

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Parents	
General Public	
Other	

Pure Mathematics 20
Module 5: Mathematical Reasoning and Geometry
Assignment Booklet 5B
Learning Technologies Branch
ISBN 0-7741-1904-7

ALL RIGHTS RESERVED

Copyright © 1999, 2001, the Crown in Right of Alberta, as represented by the Minister of Learning, Alberta Learning, 11160 Jasper Avenue, Edmonton, Alberta T5K 0L2. All rights reserved. Additional copies may be obtained from the Learning Resources Centre.

No part of this courseware may be reproduced in any form, including photocopying (unless otherwise indicated), without the written permission of Alberta Learning.

Every effort has been made both to provide proper acknowledgement of the original source and to comply with copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Learning so that appropriate corrective action can be taken.

IT IS STRICTLY PROHIBITED TO COPY ANY PART OF THESE MATERIALS UNDER THE TERMS OF A LICENCE FROM A COLLECTIVE OR A LICENSING BODY.

ASSIGNMENT BOOKLET 5B
PURE MATHEMATICS 20: MODULE 5
SECTION 3 ASSIGNMENT AND FINAL MODULE ASSIGNMENT

Your mark on this module will be determined by how well you do your assignments in the Assignment Booklets.

This Assignment Booklet is worth 80 marks out of the total 160 marks for Module 5.

Work slowly and carefully. If you are having difficulties, go back and review the appropriate topic.

Be sure to proofread each assignment carefully.

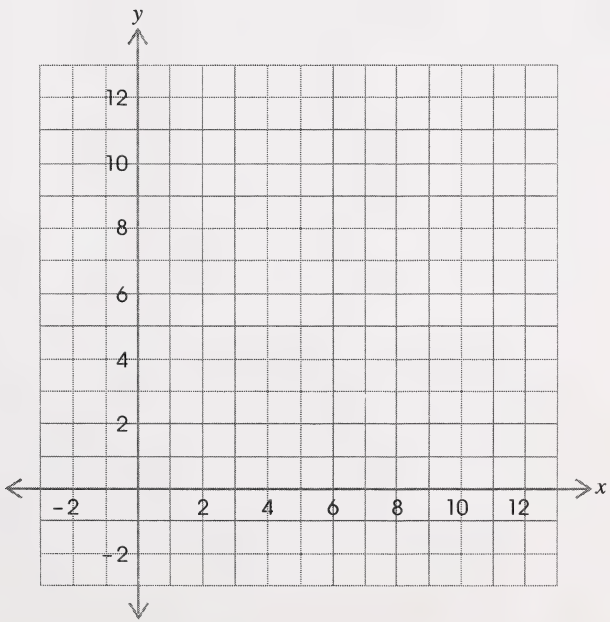
(60)

Section 3 Assignment: Coordinate Geometry

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

1. The vertices of a quadrilateral are $A(1,4)$, $B(5,11)$, $C(10,10)$, and $D(11,2)$.

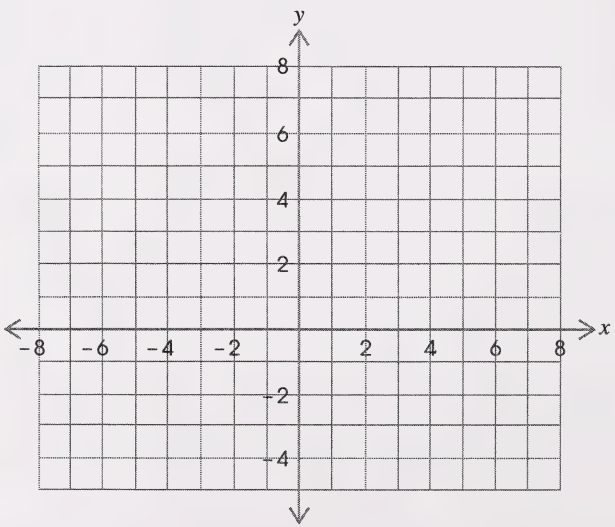
(1) **a.** Draw the quadrilateral.



(3) **b.** Prove that the diagonals intersect at right angles.

2. The vertices of a right triangle are $A(-3,1)$, $B(-3,7)$, and $C(5,1)$.

(1) **a.** Draw a diagram.



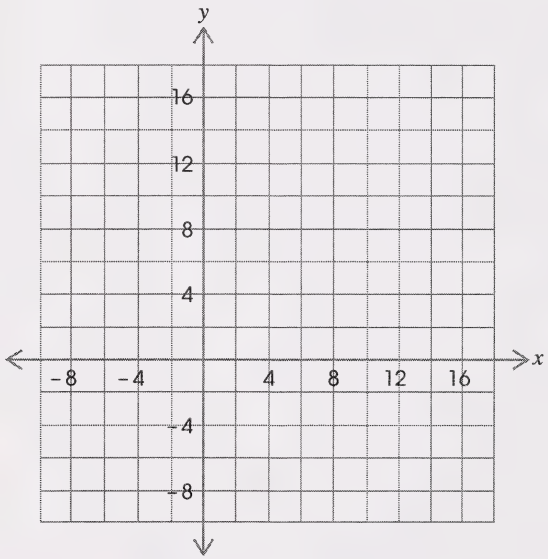
(2) **b.** Explain why ΔABC is a right triangle.

(4) **c.** Prove that the median, AM, from the right angle to the hypotenuse is one-half the length of the hypotenuse, BC.

(2) **d.** Determine the area of ΔACM in square units.

3. The vertices of a triangle are $A(13,13)$, $B(9,3)$, and $C(-1,-1)$.

(1) **a.** Draw a diagram.



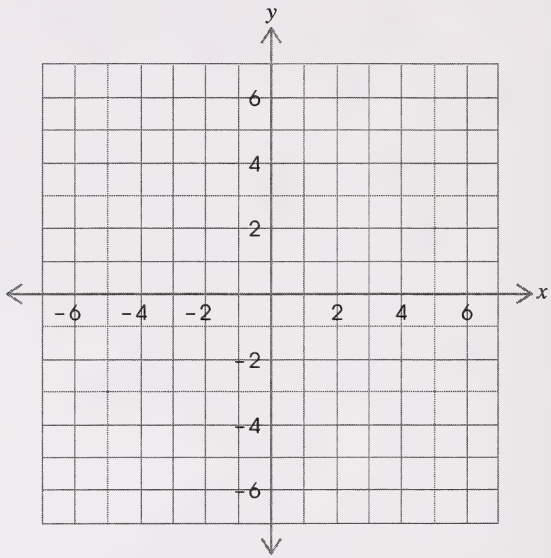
(3) **b.** Determine the equation of the median AM, where M is the midpoint of BC.

(3) **c.** Determine the equation of the median BN, where N is the midpoint of AC.

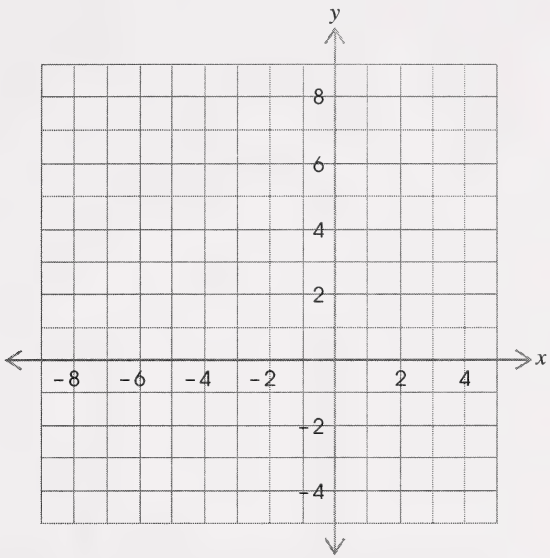
(3) **d.** Use the equations of AM and BN to determine the coordinates of P, the point of intersection of AM and BN.

(3) **e.** Prove that the distance between P and M is one-third the length of median, AM.

(5) **4.** Given $A(-1,3)$ and $B(4,5)$, determine the coordinates of the points that divide line segment AB into 3 congruent parts. Draw a graph to show your results.

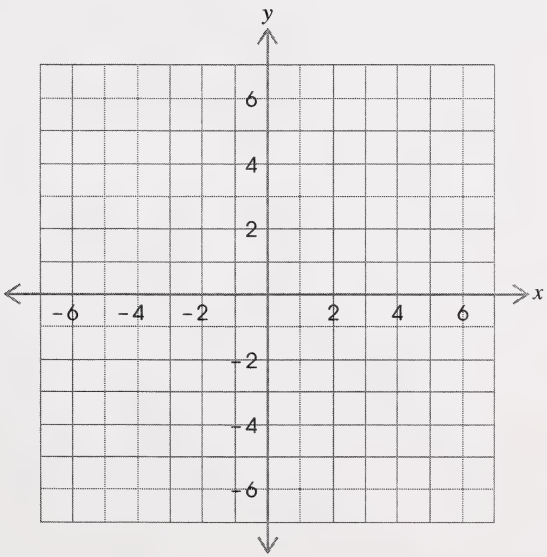


(3) **5.** Determine the equation of the circle with centre $C(-3,2)$ and passing through $P(2,3)$.



6. The line $3x+4y-14=0$ is tangent to the circle with centre $C(-1,-2)$.

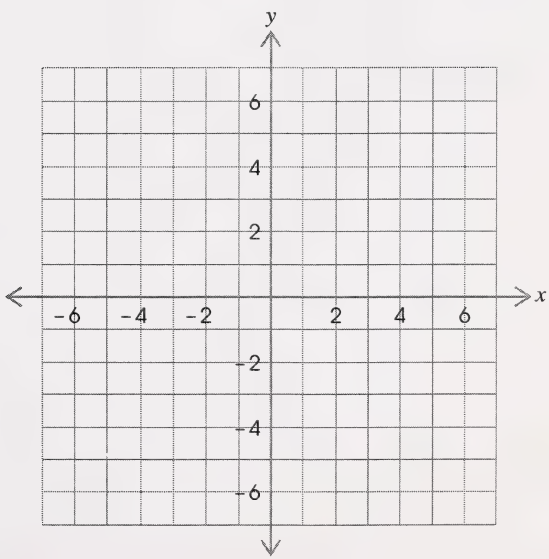
(2) **a.** Draw the diagram.



(6) **b.** Determine the radius of the circle algebraically.

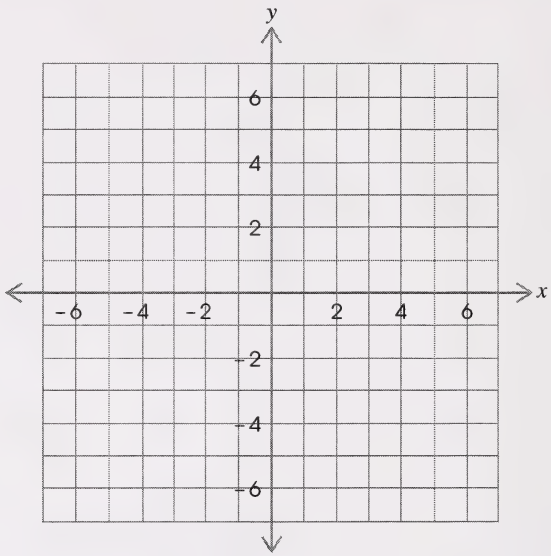
(2) **c.** Write the equation of this circle.

(6) **7.** Determine the diameter of the largest circle that can be drawn between the parallel lines $y = 2x$ and $y = 2x - 5$.



(5)

8. a. Find the points of intersection of the circle $x^2 + (y-1)^2 = 25$ and $y = -7x + 26$ by solving a system of equations.



(2) **b.** Find the length of the chord determined by the points of intersection in question 8.a. Express your answer in simplest radical form.

(3) **c.** Determine the distance of the chord from the centre of the circle.

20

Final Module Assignment

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

(2) **1.** Describe the difference between inductive reasoning and deductive reasoning.

(2) **2.** If n is a natural number, what values of n make the following compound sentence true?

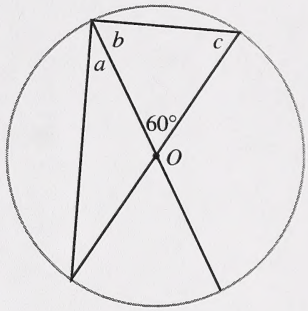
"A natural number, n, is a factor of 6 or it is a prime less than 11."

(4) **3.** Write the converse and contrapositive of the following statement concerning whole numbers. Decide whether each of the three statements is true, and provide a counterexample for any statement that is not true.

"If a and b are consecutive odd numbers, then $a+b$ is an even number."

(6)

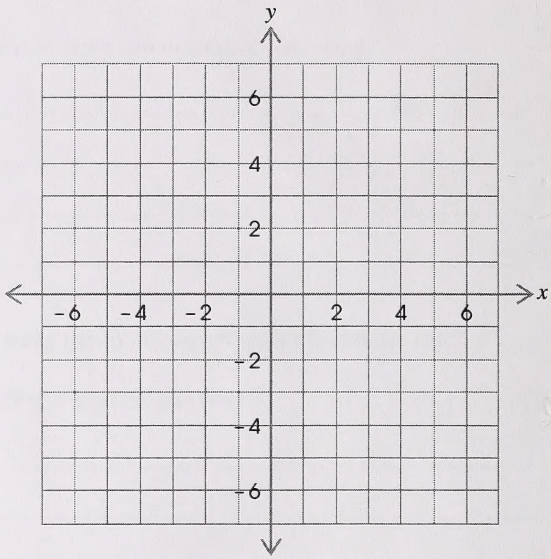
4. Point O is the centre of the circle in the diagram given. Find the measures of $\angle a$, $\angle b$, and $\angle c$. Explain your reasoning.



(3)

5. Explain, in words, how two non-parallel chords of a circle can be used to locate the centre of the circle; then show your explanation with a diagram.

(3) **6.** By solving the system of equations, determine points A and B, the points of intersection of the circle $x^2 + y^2 = 25$, and the line $y = 3$. Draw a diagram.



Pure Mathematics 20
Assignment Booklet 5B
Module 5
LRC
1999, 2001